IB/2004/102338

Sertifikaat

REPUBLIEK VAN SUID AFRIKA

PATENT KANTOOR
DEPARTEMENT VAN HANDEL EN NYWERHEID

Certificate

REPUBLIC OF SOUTH AFRICA

PATENT OFFICE
DEPARTMENT OF TRADE AND INDUSTRY

Hiermee word gesertifiseer dat
This is to certify that

the documents attached hereto are true copies of Forms P1, P2 and provisional specification and drawings of South African Patent Application No. 2003/8017 in the name of Integrated Pool Products (Proprietary) Limited

Filed : 15 October 2003

Entitled : Submerged Surface Cleaner

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Geteken te **PRETORIA** in die Republiek van Suid-Afrika, hierdie 30th dag van **July 2004**

Signed at **PRETORIA** in the Republic of South Africa, this 30th day of **July 2004**

.....
Registrar of Patents

FORM P.2

REPUBLIC OF SOUTH AFRICA	REGISTER OF PATENTS	PATENTS ACT, 1978

OFFICIAL APPLICATION	LODGING DATE: PROVISIONAL	ACCEPTANCE DATE
21 01 2003/8017	22 15 OCT 2003	47
INTERNATIONAL CLASSIFICATION	**LODGING DATE: COMPLETE**	**GRANTED DATE**
51	23	

FULL NAME(S) OF APPLICANT(S)/PATENTEE(S)

71 INTEGRATED POOL PRODUCTS (PROPRIETARY) LIMITED

APPLICANTS SUBSTITUTED:	DATE REGISTERED
71	

ASSIGNEE(S)	DATE REGISTERED
71	

FULL NAME(S) OF INVENTOR(S)

72 SUPRA, CARL FREDERICK WILHELM

PRIORITY CLAIMED	COUNTRY	NUMBER	DATE
N.B. Use International abbreviation for country (see Schedule 4)	33 NIL	31 NIL	32 NIL

TITLE OF INVENTION

54 SUBMERGED SURFACE CLEANER

ADDRESS OF APPLICANT(S)/PATENTEE(S)

70 DRIEFONTEIN, MULDERSDRIFT, KRUGERSDORP, GAUTENG, SOUTH AFRICA

ADDRESS FOR SERVICE	S & F REF
74 SPOOR & FISHER, SANDTON	PA135714/P

PATENT OF ADDITION NO.	DATE OF ANY CHANGE
61	
FRESH APPLICATION BASED ON	**DATE OF ANY CHANGE**

SPOOR & FISHER

REPUBLIC OF SOUTH AFRICA REVENUE

FORM P.1

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT

AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30 (1) – Regulation 22)

15.10.03

R 0060.00

HASB 711
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The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

REPUBLIEK VAN SUID-AFRIKA

OFFICIAL APPLICATION NO.		REFERENCE
21	01	2003/8017

PA135714/P

FULL NAME(S) OF APPLICANT(S)

71	INTEGRATED POOL PRODUCTS (PROPRIETARY) LIMITED

ADDRESS(ES) OF APPLICANT(S)

	70 DRIEFONTEIN, MULDERSDRIFT, KRUGERSDORP, GAUTENG, SOUTH AFRICA

TITLE OF INVENTION

54	SUBMERGED SURFACE CLEANER

THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. THE EARLIEST PRIORITY CLAIM IS:

COUNTRY:	NUMBER:	DATE:
NIL	NIL	NIL

~~THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.~~

21	01	

~~THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND IS BASED ON APPLICATION NO.~~

21	01	

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1. A single copy of a provisional specification of 9 pages.
- ☒ 2. Drawings of 4 sheets.
- ☐ 3. Publication particulars and abstract (Form P.8 in duplicate).
- ☐ 4. A copy of Figure of the drawings (if any) for the abstract.
- ☒ 5. Assignment of invention.
- ☐ 6. Certified priority document.
- ☐ 7. Translation of the priority document.
- ☐ 8. Assignment of priority rights.
- ☐ 9. A copy of the Form P.2 and the specification of S.A. Patent Application No .
- ☒ 10. Declaration and power of attorney on Form P.3.
- ☐ 11. Request for ante-dating on Form P.4.
- ☐ 12. Request for classification on Form P.9.
- ☒ 13. Form P.2 in duplicate.
- ☐ 14. Other.

74	ADDRESS FOR SERVICE: SPOOR & FISHER, SANDTON

Dated: 15 October 2003

SPOOR & FISHER
PATENT ATTORNEYS FOR THE APPLICANT(S)

REGISTRAR OF PATENTS DESIGNS, TRADE MARKS AND COPYRIGHT
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REGISTRATEUR VAN PATENTE, MODELLE, HANDELSMERKE EN OUTEURSREG
REGISTRAR OF PATENTS

SPOOR & FISHER

FORM P.6

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO.		LODGING DATE	
21	01 2003/8017	22	15 OCTOBER 2003

FULL NAMES OF APPLICANTS

71	INTEGRATED POOL PRODUCTS (PROPRIETARY) LIMITED

FULL NAMES OF INVENTORS

72	SUPRA, CARL FREDERICK WILHELM

TITLE OF INVENTION

54	SUBMERGED SURFACE CLEANER

"SUBMERGED SURFACE CLEANER"

BACKGROUND TO THE INVENTION

THIS invention relates to a submerged surface cleaner.

The invention relates in particular to a suction-type submerged surface cleaner, typically for use in cleaning the submerged surfaces of a swimming pool. Suction-type cleaners are well known and have been in widespread use for a number of years.

The most popular suction-type pool cleaners are connected by a flexible hose to a suction point, typically a suction inlet at the weir of the swimming pool. The cleaner operates on the submerged surface and water is sucked through it by the pump of the swimming pool filtration unit. One particularly popular pool cleaner has a valve chamber with an inlet, adjacent the submerged surface, through which a water flow is sucked and accommodating a valve member or hammer which oscillates under the influence of the suction flow and which directs the flow alternately to one or the other of a pair of outlet passages leading away from the valve chamber to the hose. The resulting variations in momentum of the water flow as well as variations in the suction effect at the inlet cause the cleaner to move, preferably in a random manner, over the submerged surfaces of the pool.

It is common for the body of a cleaner of the type described above to be composed of one or more component parts of injection moulded construction and to incorporate one or more external floats as well as an

external weight to provide the cleaner with the buoyancy and ballast required to maintain it at an appropriate attitude when submerged in the pool. It has also been suggested, in WO 00/40826, to mould the plastic structure of the cleaner around a flotation component on an upper side of the body of the cleaner and a weight on a lower side of the body of the cleaner.

It is believed that the use of external floats or a float encapsulated in the moulded plastic material of the cleaner adds unnecessarily to the complexity and cost of manufacture of the cleaner.

SUMMARY OF THE INVENTION

According to the invention there is provided a suction-type submerged surface cleaner comprising:

- an injection moulded cleaner head defining an internal valve chamber formed by valve chamber walls;
- an inlet to the valve chamber;
- an outlet from the valve chamber; and
- a wedge-shaped valve member arranged to oscillate in the valve chamber, about the apex of the member and under the influence of liquid sucked through the valve chamber from the inlet to the outlet, between respective positions in which edges of the valve member remote from the apex alternately contact internal surfaces of opposing valve chamber walls, thereby to control the flow of liquid through the cleaner head;

wherein the valve chamber walls are porous to provide the cleaner with buoyancy and wherein contact regions of the valve chamber walls, which

are contacted internally by the said edges of the valve member, are reduced locally in thickness compared to other regions of the valve chamber walls.

The preferred embodiment also includes outlet passages which extend from the valve chamber outlet. The passages may be provided side-by-side in a tubular structure, typically of injection moulded construction, which is connectable in a sealed manner to the cleaner head. The tubular structure may be injection moulded separately from the cleaner head and may include a hollow interior subdivided internally to form the outlet passages by an interior dividing wall.

The reduction in wall thickness may be formed by localised indentations in the external surfaces of the opposing valve chamber walls.

Preferably, the cleaner head is injection moulded using a blowing agent which creates porosity in thicker regions of the valve chamber walls to provide the cleaner with buoyancy for the purposes of maintaining the operative attitude of the cleaner and thereby obviating the need for any separate flotation device.

Preferably also, the valve chamber inlet is provided by an opening in a cover which is outwardly convex relative to the valve chamber.

The preferred cleaner includes a ballast weight attached externally to a valve chamber wall.

The cleaner of the invention may also include an elongate bumper strip having an operatively upper end engagable selectively with any one of a series of retaining formations on the exterior of the tubular structure and an operatively lower end engagable with the weight member with the bumper strip in a bowed configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows an exploded perspective view of a submerged surface cleaner according to this invention;

Figure 2 shows a side view of the assembled cleaner with certain components omitted;

Figure 3 shows a bottom perspective view of the cleaner as illustrated in Figure 2;

Figure 4 shows a longitudinal cross-section through the cleaner;

Figure 5 shows a sectioned perspective view of the cleaner head; and

Figure 6 shows a transverse cross-sectional view of the tubular structure of the cleaner at the line 6-6 in Figure 5.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The drawings show a suction-type submerged surface cleaner 10 according to the invention.

The cleaner 10 includes a cleaner head 12 which defines a valve chamber 14 accomodating a wedge-shaped valve member or hammer 16. The cleaner head terminates at its operatively lower end in a circular foot 18 to which an annular polyurethane footpad 20 is fitted in use, with the inner extremity of a flexible polyurethane skirt 22 sandwiched between the foot and the footpad.

The foot 18 defines a generally rectangular entrance opening 24. Referring to Figure 4, the entrance opening 24 leads to an entrance space 26 having slot-shaped openings 28 on opposite sides and leading to the valve chamber 14. An inlet to the valve chamber is provided by a central opening 30 in a cover 32 which spans across the operatively upper end of the entrance space.

The cover 32 is a separately moulded component with integral projections 34 which are clipped into holes 36 formed in the cleaner head. It will be noted that the cover is generally rectangular and is outwardly convex relative to the valve chamber. The importance of this is described below.

The hammer 16 is wedge-shaped and, although capable of oscillating, is located loosely in the valve chamber. The hammer has an apex 38 and opposite wedge surfaces 40 terminating at edges 42 remote from the apex. Typically the hammer is of moulded polyurethane.

Figure 5 shows a sectional perspective view showing a half of the cleaner head and, in exploded relationship thereto, the cover 30, the hammer 16 and a retainer 44. During manufacture, the retainer 44 is placed in the mould used for the cleaner head and is moulded into the cleaner head, in the position seen in Figure 4, adjacent an outlet 45 from the valve chamber.

The valve chamber is defined by valve chamber walls including a bottom wall 46, an opposite top wall 48 (visible in Figure 4 but not shown in Figure 5) and side walls 50. The hammer 16 can oscillate in a zone 52 defined between steps 53 on the top and bottom walls. During such oscillations, the edges 42 of the hammer 16 make contact alternately with internal surfaces 54 of the opposing top and bottom valve chamber walls 46 and 48. The internal surfaces 54 are provided in regions 56 of the walls 46 and 48 which are reduced in thickness compared to the walls in other regions of the valve chamber. The importance of this is described later. It will be noted that reduced thickness in the regions 56 is attributable to external indentations 58 in the walls 46 and 48.

The retainer 44 has a lower clevis 58 which loosely receives the apex of the hammer 16 and an upper clevis 60.

The cleaner 10 also includes passages 62 and 64 provided side-by-side in a tubular structure 66 of injection moulded construction. As shown in Figure 6, the structure 66 has a central hollow which is sub-divided, by an integral dividing wall 68, to form the respective passages 62 and 64.

A reduced diameter upstream or lower end of the tubular structure 66 is received in a sealed telescopic fit by the upper or outlet end of the cleaner head. At the same time, the lower end of the dividing wall 68 is received in a sealed manner in the upper clevis 60.

The outlet 45 from the valve chamber is circular in cross-section and, with the tubular structure 66 connected to the cleaner head as just described, communicates directly with the passages 62 and 64. At the upstream or lower end, the hollow of the tubular structure which defines the passages 62 and 64 has a circular cross-section corresponding to that of the valve chamber outlet. Proceeding upwardly, in the downstream direction, the circular cross-section converts to a polygonal cross-section as will be apparent from Figure 6. Externally, the tubular structure 66 has a circular cross-section as illustrated. To facilitate demoulding of the tubular structure, i.e. extraction of the necessary core, the structure tapers in overall cross-section, from the lower or upstream end to the upper or downstream end.

The cleaner 10 also includes a bump strip 70 and a ballast weight 72. The ballast weight 72 consists of an appropriate lead mass encapsulated in a moulded plastic cover and is secured to the cleaner head, beneath the valve chamber, by screws 73. The bump strip 70 consists of a length of suitable stiff plastics material which has respective formations 74 and 76 at its upper and lower ends. During assembly of the cleaner, the lower formation 76 is trapped between the ballast weight 72 and the cleaner head and is retained permanently in position by the screws 73. The upper formation is fork shaped and is engagable selectively with any chosen one

of a series of tooth-like formations 78 on the lower side of the tubular structure 66, near to its upper end. When so engaged, the bump strip assumes a bowed configuration as seen in Figure 2. As also seen in Figure 2, the extent of the bowing of the bump strip can be varied by varying the upper engagement point. Those skilled in the art will understand that the bump strip is provided to deflect the cleaner, as it moves about the submerged surfaces of a swimming pool, from obstacles such as steps or the like, and thereby ensure that the cleaner is not immobilised by such obstacles.

Extending along the upper surface of the outlet end of the cleaner head is an upwardly extending fin 80. A corresponding fin 82 extends longitudinally along the upper side of the tubular structure 66. These fins cooperate with one another, thereby forming a continuous fin as seen in Figure 2, when the tubular structure is mated with the tubular structure as described above.

Those skilled in the art will understand the mode of operation of submerged surface cleaners of the general type described above. In use a flexible hose extending from a suction point, such as the suction inlet in a swimming pool weir is connected to the upper end of the tubular structure 66 via swivel components 84 seen in Figure 1, which allow the cleaner to swivel freely relative to the hose. Suction applied to the cleaner causes water to be drawn through the entrance opening 24 and side openings 28 into the entrance space 26. The water carries with it entrains submerged muck. In addition, leaves and other submerged debris lifted by the skirt 22 are able to enter the entrance space through the side openings 28.

From the entrance opening, water and entrained muck and debris are drawn into the valve chamber through the inlet opening 30 in the cover 32. The suction draws the hammer 16 into the clevis 58. With the hammer 16 at, say, a lower position, with its lower edge 42 contacting the internal surface 54 of the bottom wall 46, access to the lower passage 64 is blocked. The water is therefore obliged to flow over the hammer, through the valve chamber outlet and into the upper passage 62 and from there into

the flexible hose. The flow generates a low pressure over the hammer which causes it to pivot upwardly about its apex. The upper edge 42 of the hammer then contacts the surface 54 of the upper wall 48, blocking off access to the upper passage 62. The low pressure beneath the hammer now draws it down again, and the process repeats itself, i.e. the hammer oscillates up and down with its edges 42 alternately making contact with the upper and lower valve chamber walls. Flow into each passage must overcome the inertia of the column of water in that passage from the previous cycle. The rapid changes in momentum of the water columns, combined with varying suction effects at the entrance opening 24 cause the cleaner to move randomly over the submerged surfaces.

For proper operation it is important that the cleaner be at the correct attitude in the water. For this reason, the cleaner head and tubular structure 66 are moulded using a blowing agent which creates a porous structure. The ballast weight 72 acts in cooperation with the porosity-created buoyancy to ensure that the cleaner operates at the appropriate attitude.

It will be understood that the required buoyancy can only be created in walls of the cleaner which are of sufficient thickness. For this reason, the majority of each wall forming the valve chamber has a substantial thickness, in some cases 8mm or more. However a problem which is encountered in the injection moulding of plastic walls of such thickness is that differential cooling on demoulding can lead to irregularities in the molded surfaces.

It is recognized that it is important for the internal surfaces 54 of the walls 46 and 48 to be sufficiently accurate and free of irregularities for the edges 42 of the hammer 16 to make sealing contact as the hammer oscillates. Experience has shown that if there are imperfections which could lead to poor sealing of the hammer at each end of its stroke, the cleaner 10 will not operate efficiently. It is for this reason that the wall thickness in the regions 56 is reduced to a value at which sufficiently accurate surfaces 54 can be obtained for proper sealing on each stroke of the hammer.

It will be understood that porosity in the fins 80 and 82 contributes buoyancy to maintain the cleaner at the correct operative attitude.

As indicated above, the cover 32 is outwardly convex with respect to the valve chamber. Thus the inlet opening 30 is spaced some distance from the hammer. With this feature, the chance of leaves or other sunken debris getting jammed between hammer and the inlet opening, and thereby arresting the hammer and bringing the cleaner to a standstill, is reduced.

Dated the 15th October 2003

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Spoor & Fisher
Applicant's Patent Attorneys

Integrated Pool Products (Pty) Ltd
Provisional Specification

Fig.1

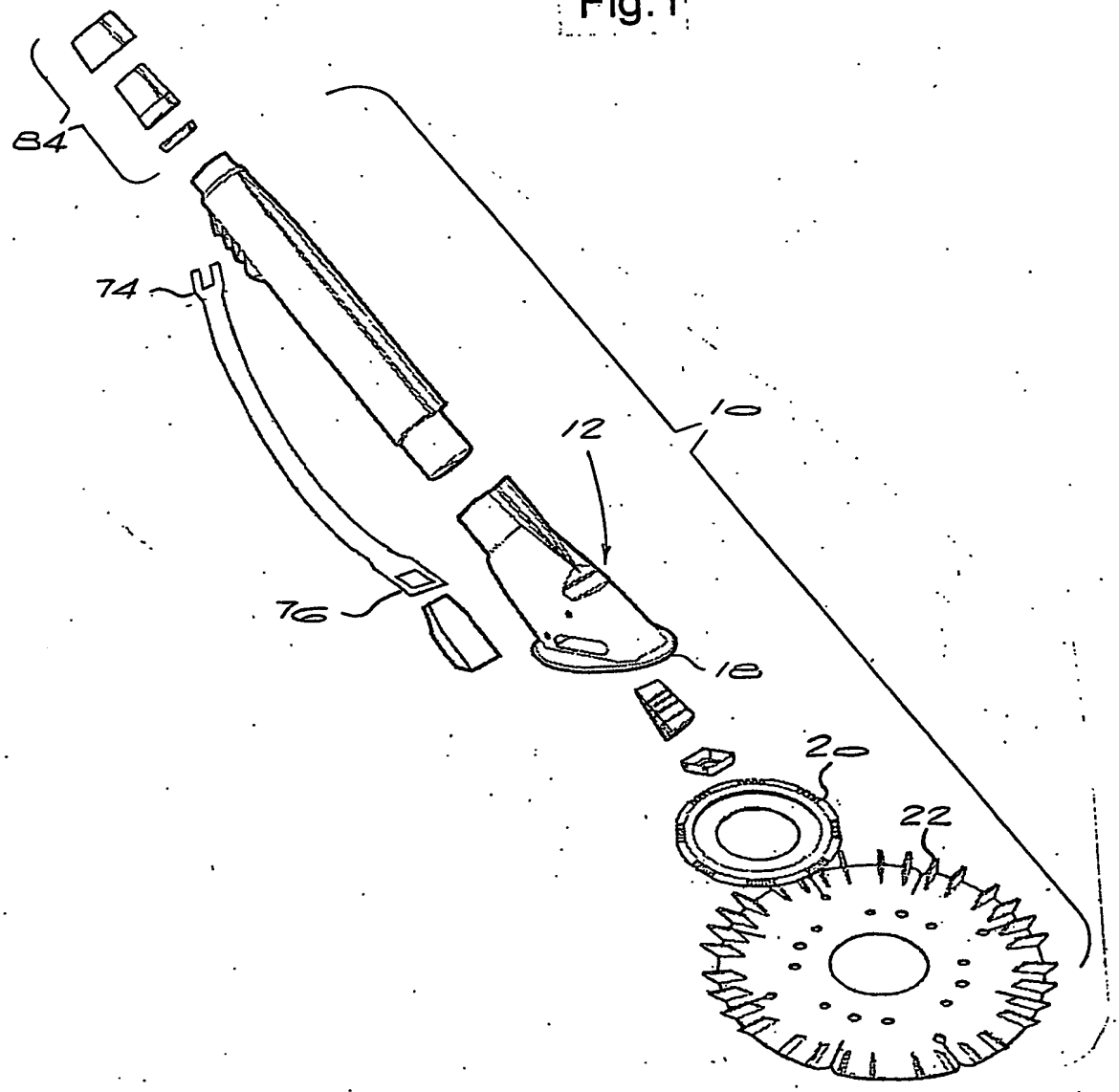

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Fig.2

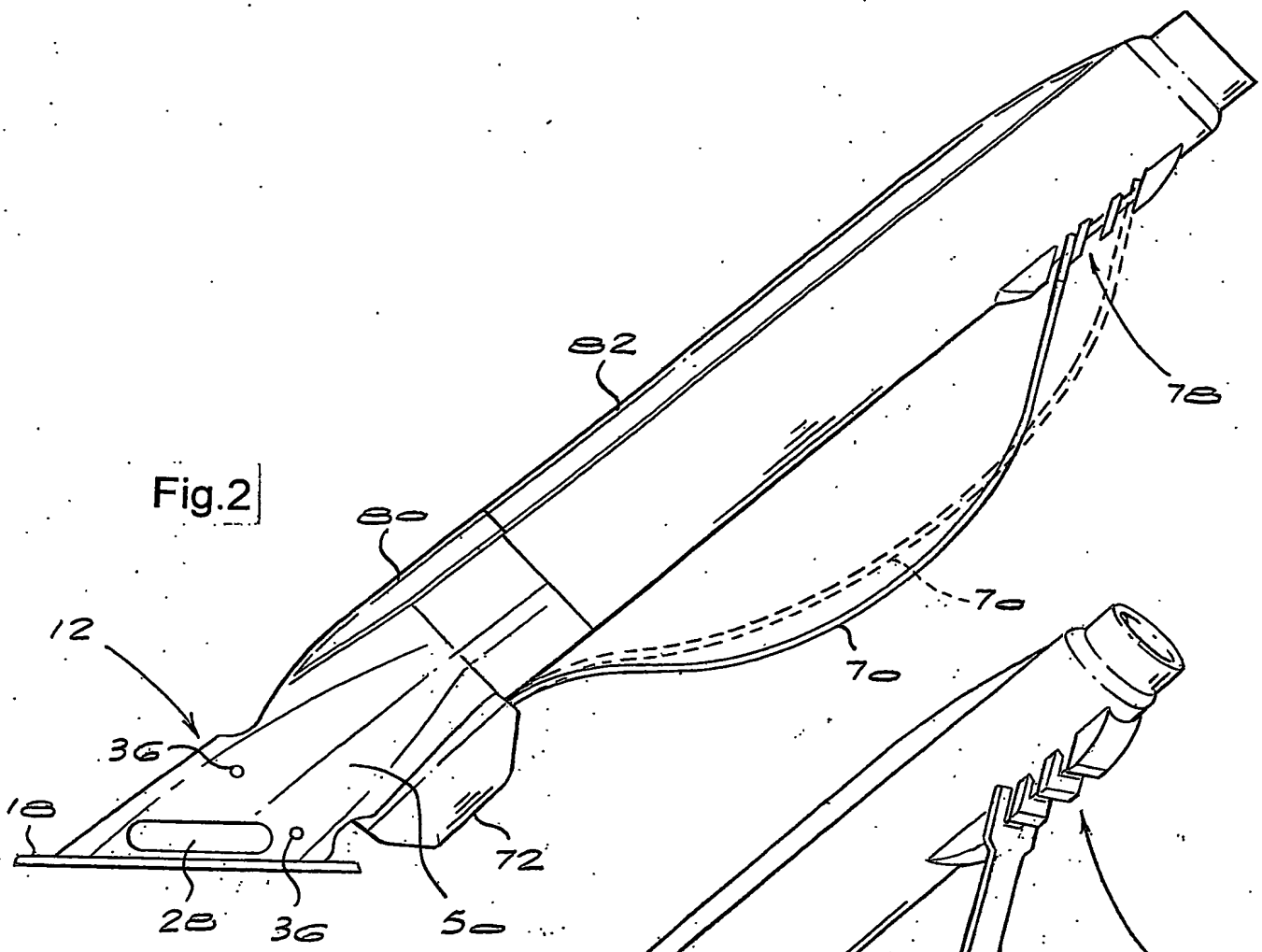

Fig.3

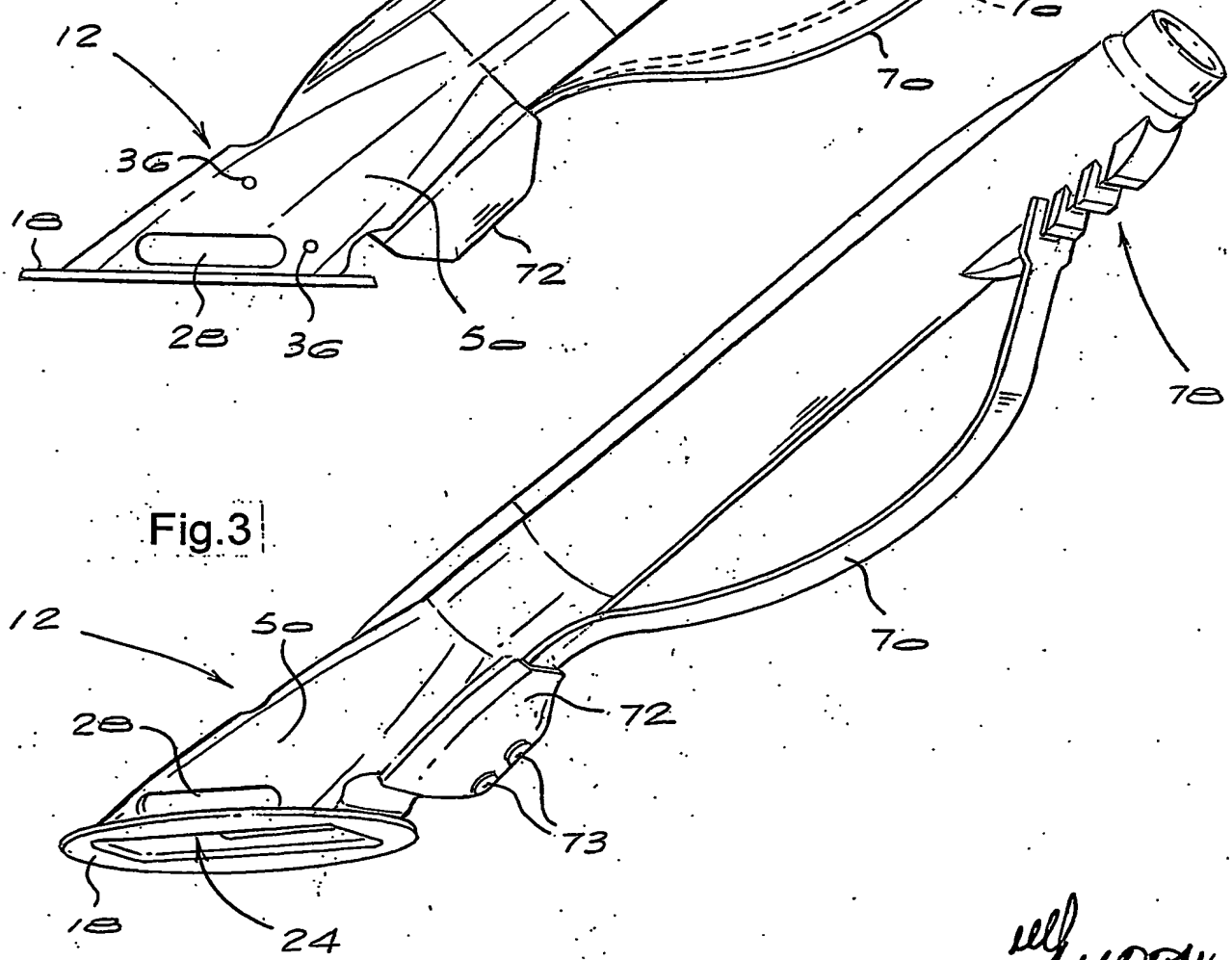

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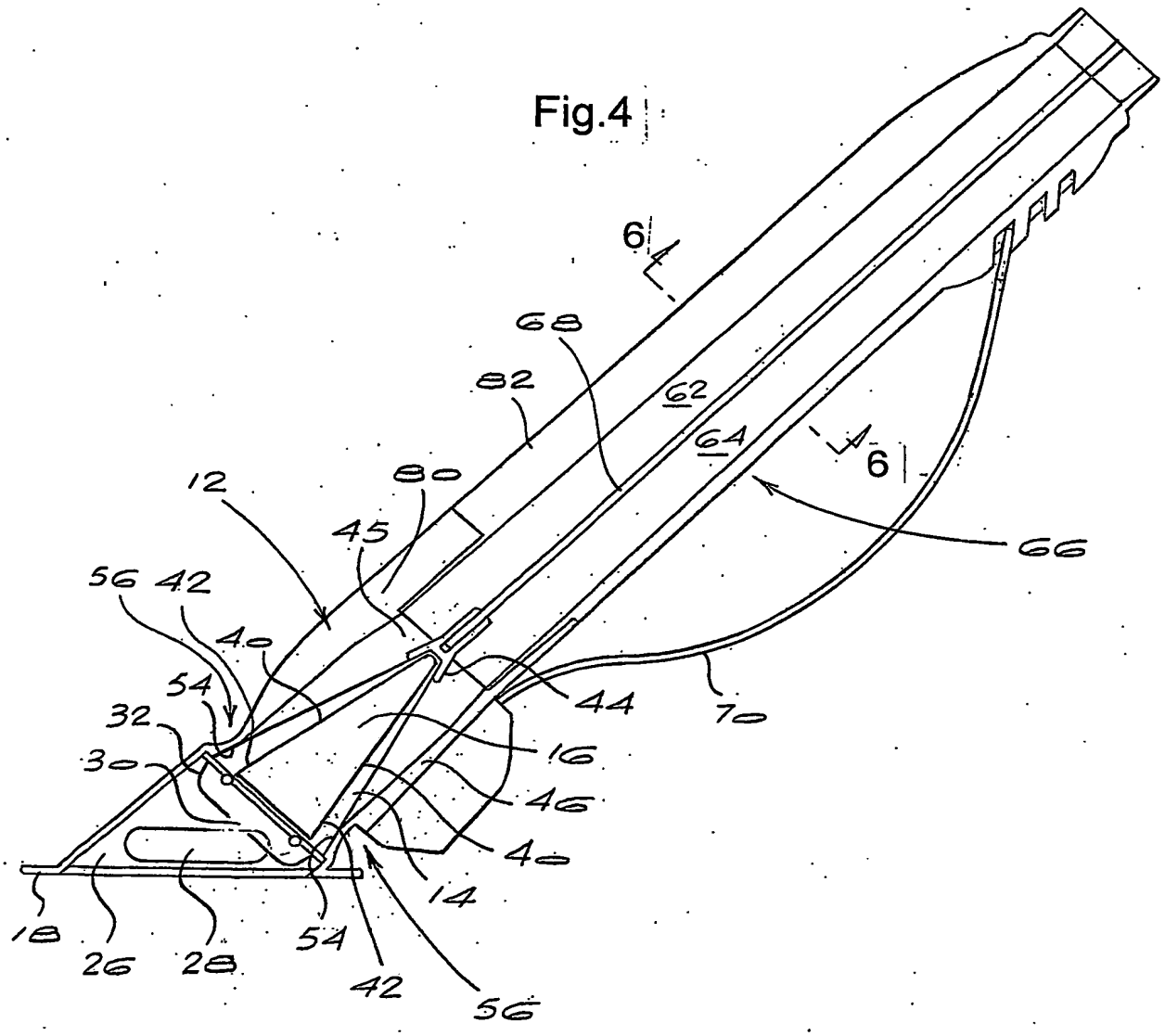
Fig.4



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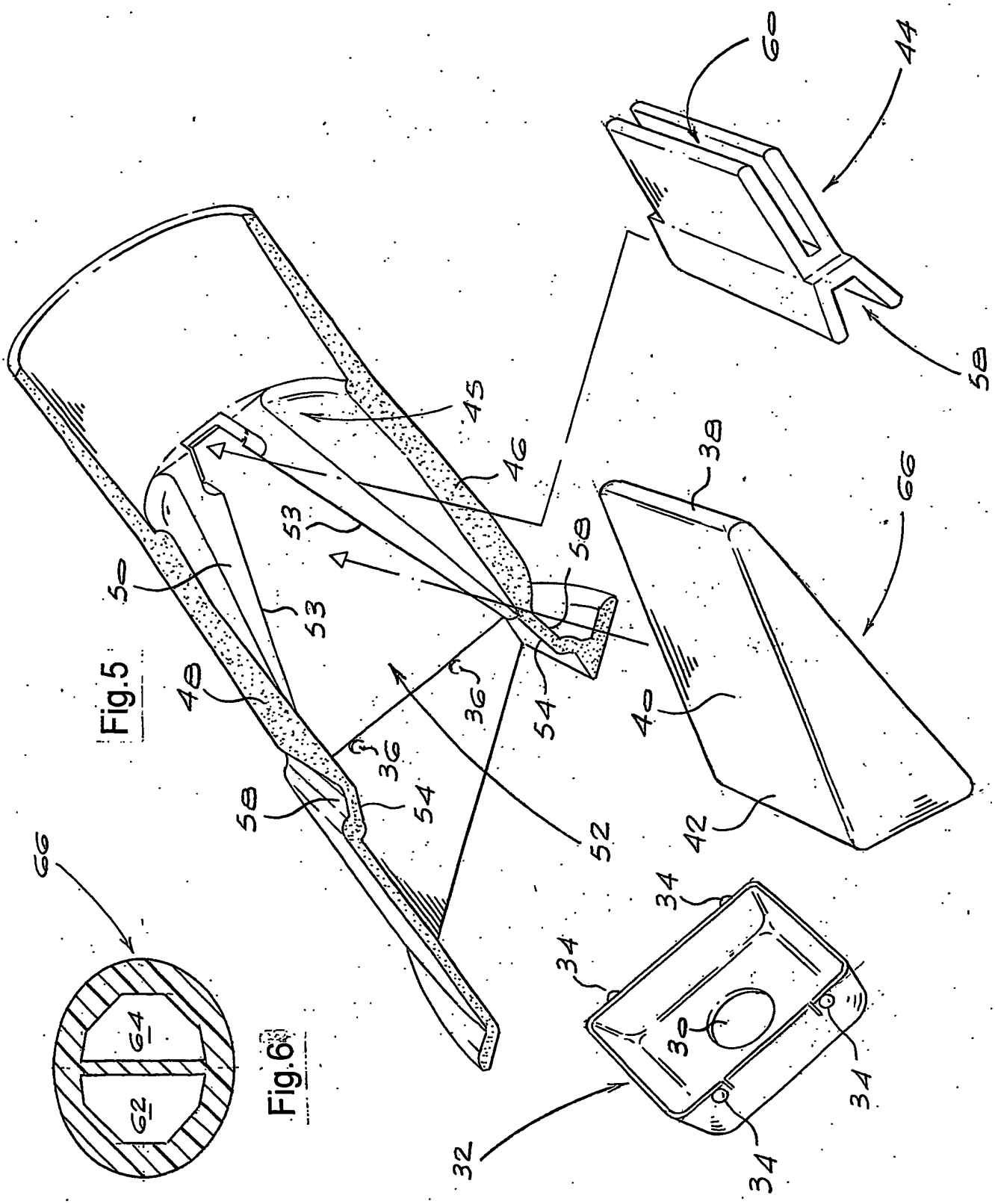

Fig.5

Fig.6

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